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Railway applications - Driver's cab - Part 4: Layout and access

Bahnanwendungen - Führerraum - Teil 4: Gestaltung und Zugang

Applications ferroviaires - Cabine de conduite - Partie 4 : Aménagement et accès

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4 : Agencement et accès

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und Zugang

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 256.

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Foreword

This document (prEN 16186-4:2017) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

EN 16186 *Railway applications — Driver’s cab* consists of the following parts:

- Part 1: Anthropometric data and visibility
- Part 2: Integration of displays, controls and indicators
- Part 3: Design of displays
- Part 4: Access and layout

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Introduction

This part of EN 16186 addresses design rules and requirements for the layout and design of the driver's cab considering operational requirements for train driving, shunting and related preparatory work as far as driver's cab interfaces are concerned. It provides current cab design principles and considers latest available research findings provided by the European Research project EUDD+ [37][37].

If a requirement contains an option, the choice of this option is purely up to the applicant.

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1 Scope

This European standard gives design rules and guidance in order to ensure proper access, lighting; seating and exit of the driver's cab. The different dimensions are based on the anthropometric data defined in EN 16186-1. The corresponding assessment methods are also included in this standard. It covers the following aspects:

- dimension and interior layout;
- door access, steps, floor characteristics;
- seats dimension and clearance;
- interior cab lighting;
- emergency exit;
- marking and labelling.

This part of EN 16186 applies to driver's cabs of Electrical Multiple Unit (EMU), Diesel Multiple Unit (DMU), Railcars, Locomotives and Driving trailers (Driving Coaches).

NOTE 1 This European standard applies to rolling stock in the scope of the Directive 2008/57/EC [6].

For OTMs, see EN 14033-1 [12] and EN 15746-1 [18].

This part of EN 16186 applies to driver's desks installed on the left, on the right, or in a central position in the driver's cab. Due to cab space and resulting desk integration constraints, desk layout can vary.

NOTE 2 Due to railway systems constraints, the level of comfort and accessibility provided to the persons outside the anthropometric range defined in EN 16186-1 may vary. Usually the operators manage the potential restrictions, if the driver uses extreme seat positions combined with extreme body heights.

This standard is not intended to be applicable for tramways, metro and light rail vehicles.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 894-3, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 3: Control actuators*

EN 1005-3, *Safety of machinery — Human physical performance — Part 3: Recommended force limits for machinery operation*

EN 12663-1, *Railway applications — Structural requirements of railway vehicle bodies — Part 1: Locomotives and passenger rolling stock (and alternative method for freight wagons)*

EN 14752:2015, *Railway applications - Body side entrance systems for rolling stock*

EN 15227, *Railway applications — Crashworthiness requirements for railway vehicle bodies*

EN 16186-1, *Railway applications — Driver's cab — Part 1: Anthropometric data and visibility*

EN 16186-2, *Railway applications — Driver's cab — Part 2: Integration of screens, controls and indicators*

EN ISO 2813, *Paints and varnishes - Determination of gloss value at 20°, 60° and 85° (ISO 2813)*

EN ISO 3385, *Flexible cellular polymeric materials - Determination of fatigue by constant-load pounding (ISO 3385)*

ISO 3864-1:2002 ¹⁾, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs in workplaces and public areas*

ISO 7001:2007, *Graphical symbols — Public information symbols*

ISO 7010:2003 ²⁾, *Graphical symbols — Safety colours and safety signs — Safety signs used in workplaces and public areas*

EN 16116-1, *Railway applications — Design requirements for steps, handrails and associated access for staff — Part 1: Passenger vehicles, luggage vans and locomotives*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 16186 series and the following apply.

3.1

driver's working area

driver's cab area where unauthorized people are not allowed to enter

3.2

passage width

see EN 14752:2015, Figure 1

3.3

specular gloss

optical property of a surface, characterized by its ability to reflect light secularly

[SOURCE: EN ISO 2813]

4 Symbols and abbreviations

For the purposes of this document, the following abbreviations are used.

CR	Conventional Rail
CCS	Control Command and Signalling
DMU	Diesel Multiple Unit

1) ISO 3864-1:2002 is replaced by ISO 3864-1:2011, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs and safety marking*

2) ISO 7010:2003 is replaced by ISO 7010:2011, available as EN ISO 7010:2012, *Graphical symbols — Safety colours and safety signs — Registered safety signs (ISO 7010:2011)*.

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EMU	Electric Multiple Unit
ETCS	European Train Control System
g	Standard acceleration due to gravity (9,81 m/s ²)
GU	Gloss Unit
OTM	On-Track Machine
RAL	Deutsches Institut für Gütesicherung und Kennzeichnung (German Institute for Quality Assurance and Certification)
SRP	Seat Reference Point

5 Driver's cab access and egress**5.1 Access, egress and doors****5.1.1 General****5.1.1.1 Access and security**

Access to the driver's cab shall be from the exterior via a direct external door, or through an adjacent compartment or area behind the cab.

Doors shall be designed to have an operational envelope that does not conflict with the envelope of another cab access door.

The driver's cab and its access shall be designed so that the train crew is able to prevent the cab being accessed by non-authorized persons, whether the cab is occupied or not. This requirement is deemed to be fulfilled by a locking system.

A cab door locking system shall permit to open any cab door from inside the cab without using any tool or key.

Exit and access to the driver's cab shall be possible without any energy supply.

5.1.1.2 Door handles

Door handles which are intended to be operated from a standing position shall be located at a height between 820 mm and 1 200 mm (distance between the rotation point of the handle and the cab floor). The recommended value for the height of the door handles is 850 mm.

5.1.1.3 Threshold

The straight part of door thresholds shall not protrude more than:

- 20 mm from the walkable floor for interior doors excluding locomotives;
- 70 mm from the walkable floor for interior doors of locomotives;
- 60 mm from the walkable floor for exterior doors.

5.1.1.4 Ergonomics

Where access for the whole hand is regularly required, at least 40 mm clearance to surrounding surfaces should be provided.

5.1.2 External doors

External doors shall be designed in accordance with EN 16116-1.

External cab doors when opened shall not infringe the intended reference profile.

External cab doors should be designed to open towards the interior of the cab. This recommendation does not apply to shunting locomotives or locomotives with central cab and EMU/DMU where sliding or plug doors are used.

Driver's cab external doors shall have a rectangular-like minimum unobstructed passage height and minimum passage width of:

- 1 675 mm × 500 mm when accessible from outside by foot-steps, or;
- 1 750 mm × 500 mm when accessible from outside on floor level (without foot-steps, e.g. central cab external door with inside floor and outside gangway on the same level);
- 1 675 × 430 mm for central cab locomotives when accessible from outside by foot-steps, in accordance with Figure B.2;
- 1 750 mm × 430 mm for central cab locomotives (without foot-steps), in accordance with Figure B.2.

Driver's cab external doors should have a rectangular-like minimum unobstructed passage height and minimum passage width of 1 800 mm (height) × 550 mm (width) in accordance with Figure 1.

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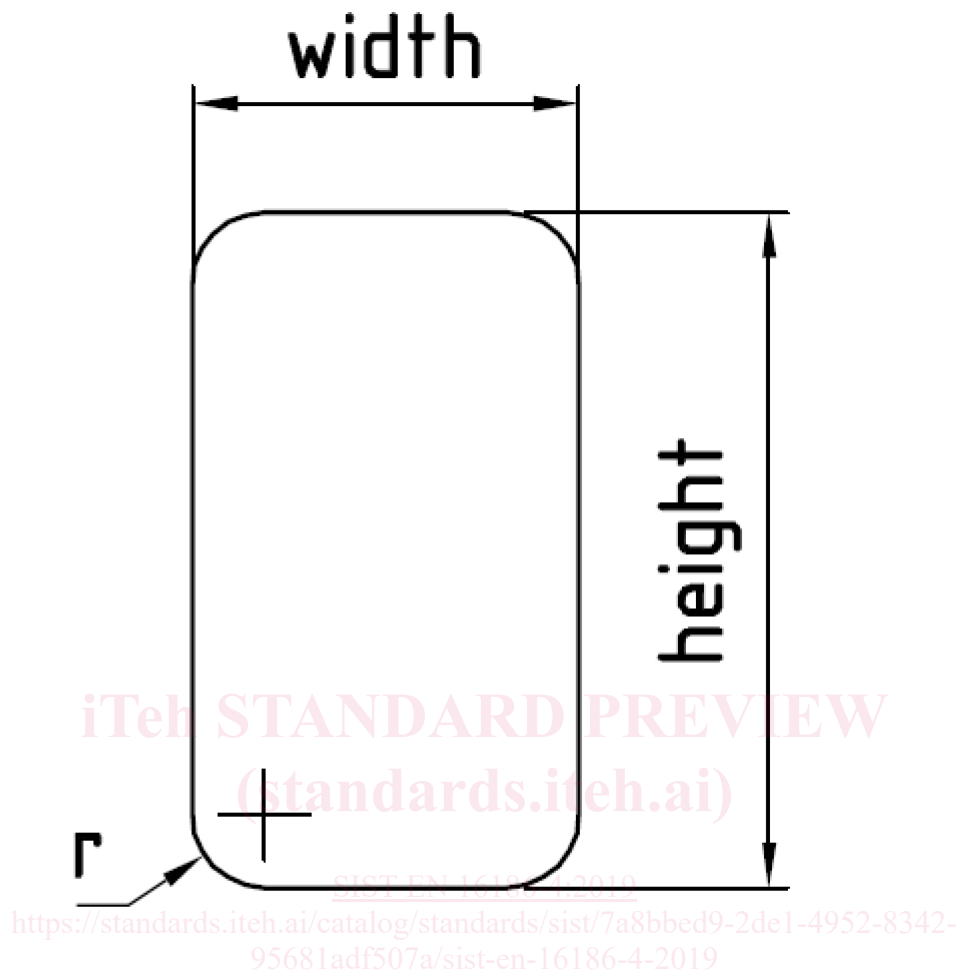


Figure 1 — Minimum unobstructed passage dimensions

Dimension r should have a maximum value of 20 % of the width.

Driver's cab front facing external doors which are positioned left or right of the vehicle's longitudinal axis and open in longitudinal direction may have a trapezium shaped upper area with an angle of the top outer side. In order to achieve a maximum passage width in the angled upper area of the door, the gauge shall be used to its full extent. This reduction due to the gauge shall keep a minimum clearance width of 280 mm in the upper area (see Figure B.2).

Cab external doors shall not open unintentionally. External cab doors should have at least two stable positions: fully open and closed.

5.1.3 Internal doors

If internal cab doors lead directly to the passenger area, a device to look from inside the cab shall be provided, (e.g. by a spy hole).

Driver's cab interior doors shall have a rectangular-like minimum unobstructed passage height and passage width of 1 700 mm × 430 mm. Driver's cab interior doors should have a rectangular-like minimum unobstructed passage height and passage width of 1 800 mm (height) × 500 mm (width).

Driver's cab interior doors which are positioned left or right of the vehicle's longitudinal axis and open in longitudinal direction may have a trapezium shaped upper area with an angle of the top outer side (see Figure B.3). In order to achieve a maximum passage width in the angled upper area of the door, the gauge shall be used to its full extent. This reduction due to the gauge shall keep a minimum clearance width of 280 mm in the upper area.

5.2 Floor and flooring

5.2.1 Floor surface criteria

Walkable floor surfaces shall be slip resistant.

This is deemed to be fulfilled by applying the requirements of CEN/TS 16165.

For minimizing the tripping hazard, the walkable floor of the cab, except for the area up to a maximum of 25 mm from the walls and for the space under the desk, shall be level.

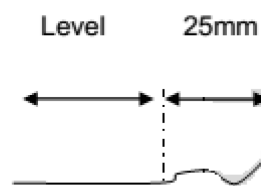


Figure 2 — Admissible irregularities

This is deemed to be fulfilled by the following criteria:

- on a level track, the walkable floor shall be horizontal with a tolerance of $\pm 2^\circ$ except for the walkable floor areas determined to changes of height, and;
- no irregularity on the walkable floor shall protrude by more than 5 mm.

Door thresholds and foot operated operational elements are not considered as being a floor irregularity.

5.2.2 Inclination, steps and slopes

Height changes > 4 mm per 100 mm length are not permitted on the walkable cab floor; they are permitted between the cab and adjacent compartments.

Height changes of interior walkable floors between the cab and adjacent compartments ≤ 60 mm shall be achieved by a sloping walkable floor. Height changes > 60 mm and < 120 mm should be avoided. Height changes ≥ 120 mm shall be achieved by steps which shall have a height ≥ 120 mm and ≤ 250 mm and a depth ≥ 270 mm.

Where the change of height is achieved by a sloping walkable floor, the minimum length of the walkable slope shall be 300 mm.

Steps immediately adjacent to slopes shall be prohibited.

Sealing plates of door frames and maintenance openings are not considered as being a floor irregularity.

5.3 Windows

5.3.1 Mechanical characteristics of glass

Where glass is used in glazing (including mirrors), it shall be either laminated or toughened glass which is in accordance with a relevant national or international standard with regard to the quality and area of use, thereby minimizing the risk to passenger and staff being injured by breaking glass.

5.3.2 Operation of opening windows

For easy moving upwards and downwards of windows (e.g. to open, or to close) the operating force should be less than 50 N and shall not be higher than 75 N.

For pushing the operating force should not be higher than 62 N and for pulling not higher than 55 N.

5.4 Emergency

5.4.1 Driver's cab emergency exits

5.4.1.1 Minimum emergency exit clearance

In an emergency situation, evacuation of the train crew from the driver's cab and access to the interior of the cab by the rescue services shall be possible on both sides of the cab by using one of the following emergency exit means: external doors or side windows or emergency hatches.

In all cases, the emergency exit shall provide a minimum clearance of 2 000 cm² with a minimum inner dimension of 400 mm to allow the release of trapped persons.

5.4.1.2 Minimum escape area

An exit shall give access to an area of a minimum length of 2 m, of a minimum clearance of height 1 700 mm x width 430 mm. This area and its floor shall be free of any obstruction; the above area shall be located on-board the unit, and can be an interior area or an area opened to the outside. A single step is not considered as an obstruction.

This clearance of height 1 700 mm × width 430 mm shall also be provided from the seat position to the exit. For requirements for high speed trains see 6.2.2.

The above requirements do not apply to central cab locomotives.

5.4.1.3 Emergency exit opening

For opening emergency exits, no equipment shall be required.

Driver's cabs shall have at least one interior exit opening outwards. If there is any risk of obstruction (baggage, passengers), the door shall be of the swing type (opening outwards and inwards) or of the sliding type.

Interior doors opening outwards within the escape route of the driver should be provided with an emergency bar to open the door (panic function). If provided, the following should apply:

- the panic function shall function always, irrespective of whether the door is unlocked or locked;
- if there is any risk of obstruction (baggage, passengers), the door shall open in both directions (outwards and inwards);
- in case of an emergency door opening in one direction, it is opened outwards via pushing an emergency push bar;
- in case of an emergency door opening in both directions the panic function shall be possible by pushing and pulling the emergency bar for opening outwards and inwards respectively;
- the emergency bar shall cover the majority of the door width;
- in all positions of the door and the emergency bar there shall be a minimum clearance of 50 mm between the emergency bar and surrounding objects in order to prevent a contusion/injury risk for the hand;

- when the door is open, there shall be a minimum unobstructed passage of 430 mm width between the emergency bar in normal (unpressed) state and the doorframe.

5.4.2 Emergency egress from seat

5.4.2.1 Seat design for escape

The driver's seat and the additional seat(s) shall not constitute an obstacle to escape in case of emergency. In any position of a seat, escape shall be facilitated by the seat design, e.g. by:

- its shape;
- rotation without need for operating any device (e.g. unlocking);
- movement of the seat;
- movement of the arm rest.

In a cab configuration with lateral desk and symmetrical seat locations, the second seat shall fulfil the same escape requirements.

5.4.2.2 Escape from seat assessment criteria

Escape from the seat to a position beside the seat (both feet on the cab floor and no part of the body still in touch with the seat) should be assessed with the following start conditions:

- at vehicle standstill;
- driver in driving and seating position (hands on the desk);
- both feet of the driver on the foot rest;
- by a small seated person in the range of 1,55 m to 1,65 m (in accordance with EN 16186-1);
- within 3 s after a verbal command;
- with arm rests, if provided, in their functional position.

Then this test should be repeated for a tall seated person in the range of 1,81 m to 1,91 m (in accordance with EN 16186-1).

NOTE This is an assessment scenario which does not represent a normal driving situation. The test person is supposed to change the settings after the start of the test.

5.4.3 Devices for emergency egress

A portable ladder or other portable devices of equivalent function to bridge the gap between emergency exit and ground for ensuring escape in case of emergency shall be provided in the driver's cab for cabs without exterior doors and without permanent means of escape inside the cab.

6 Driver's cab dimensions

6.1 Interior

6.1.1 General

The interior layout of the cab shall consider the anthropometric data as set out in EN 16186-1.